

PMC-ND

(1.08.09.13)

# U.S. DEPARTMENT OF ENERGY

## OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

### NEPA DETERMINATION

**RECIPIENT:** University of Michigan**STATE:** MI

**PROJECT TITLE** Research and Development of Architectures for Photovoltaic Cell-Level Power Balancing using Diffusion Charge Redistribution

<b>Funding Opportunity Announcement Number</b> DE-FOA-0001387	<b>Procurement Instrument Number</b> DE-EE-0007549	<b>NEPA Control Number</b> GFO-0007549-001
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Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), I have made the following determination:

**CX, EA, EIS APPENDIX AND NUMBER:****Description:**

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|---|--|
| <b>A9 Information gathering, analysis, and dissemination</b>                                | Information gathering (including, but not limited to, literature surveys, inventories, site visits, and audits), data analysis (including, but not limited to, computer modeling), document preparation (including, but not limited to, conceptual design, feasibility studies, and analytical energy supply and demand studies), and information dissemination (including, but not limited to, document publication and distribution, and classroom training and informational programs), but not including site characterization or environmental monitoring. (See also B3.1 of appendix B to this subpart.)   |
| <b>B3.6 Small-scale research and development, laboratory operations, and pilot projects</b> | Siting, construction, modification, operation, and decommissioning of facilities for smallscale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment. |

**Rationale for determination:**

The U.S. Department of Energy (DOE) is proposing to provide federal funding to University of Michigan (UM) to conduct design, research, development, fabrication, and testing of solar panels with added semiconductor integrated circuits and custom power electronics.

The activities proposed would include design, packaging, and encapsulation of an integrated circuit to accomplish the goal of photovoltaic cell-level power balancing using diffusion charge redistribution (DCR). Additional work would include the design of a cell-to-cell interconnect system and panel laminate structure for DCR and associated integrated circuits; design of a power electronic system/inverters for differential power extraction from DCR; and the fabrication of prototype panels and power electronics to test at an outdoor site with varying partial shading conditions in the Ann Arbor area.

The laboratory research and development would be performed at the Michigan Power Electronics Laboratory and the Power Electronics and Energy Research Studio, both in the Electrical Engineering and Computer Science building at UM in Ann Arbor, MI. No physical modifications of existing facilities would be required at this time for the indoor activities.

The outdoor testing site for the panels has yet to be determined, but would occur on the premises of the University of Michigan. Sites near or at existing solar installations would be preferred. Outdoor testing tasks are prohibited until the sites are defined and DOE completes additional NEPA review.

High voltages may be present during some project operations. Existing university health and safety policies and procedures would be followed including employee training, proper protective equipment, engineering controls, monitoring, and internal assessments. Additional policies and procedures would be implemented as necessary as new health and safety risks are identified. This would help ensure compliance with applicable health and safety regulations, and minimize health and safety risks to employees and the public.

Based on the review of the proposal, DOE has determined that Tasks 1 through 3 (including all subtasks) fits within the class of action(s) and the integral elements of 10 CFR 1021 subpart B outlined in the DOE categorical exclusion(s) selected above. DOE has also determined that: (1) there are no extraordinary circumstances (as defined by 10 CFR 1021.410(2)) related to the proposal that may affect the significance of the environmental effects of the



proposal; (2) the proposal has not been segmented to meet the definition of a categorical exclusion; and (3) the proposal is not connected to other actions with potentially significant impacts, related to other proposals with cumulatively significant actions, or an improper interim action. Tasks 1, 2, and 3 are categorically excluded from further NEPA review.

#### NEPA PROVISION

DOE has made a conditional NEPA determination for this award, and funding for certain tasks under this award is contingent upon the final NEPA determination.

Insert the following language in the award:

You are restricted from taking any action using federal funds, which would have an adverse affect on the environment or limit the choice of reasonable alternatives prior to DOE/NNSA providing either a NEPA clearance or a final NEPA decision regarding the project.

Prohibited actions include:

Task 4.1: Full-featured, site operational PV system (M1-M4)

Task 4.2: Test and data collection instrumentation and software (M5-M6)

Task 4.3 Operational site testing, data collection, and analysis.

This restriction does not preclude you from:

Task 1.1: Integrated Circuit (IC) with Basic Features

Task 1.2: Prototype power electronics

Task 1.3: Solar panel design

Task 2.1: Test and qualify IC with basic features

Task 2.2: Revision 2 of IC with basic features

Task 2.3: Design IC packaging

Task 2.4: Quarter-scale power electronics

Task 3.1: Integrated Circuit with Full Features

Task 3.2: Full-scale power electronics

Task 3.3: Multi-panel PV system build, integration, and testing

Task 3.4: Site and testing planning with required permitting and/or approvals

If you move forward with activities that are not authorized for federal funding by the DOE Contracting Officer in advance of the final NEPA decision, you are doing so at risk of not receiving federal funding and such costs may not be recognized as allowable cost share.

Note to Specialist :

Solar Energy Technology Office

This NEPA determination requires a tailored NEPA provision.

Review completed by Chris Rowe 07/25/2016

#### SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: \_\_\_\_\_

Electronically  
Signed By: Kristin Kerwin

NEPA Compliance Officer

Date: 7/26/2016

#### FIELD OFFICE MANAGER DETERMINATION

☐ Field Office Manager review required

#### NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:

- ☐ Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
- ☐ Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

#### BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature: \_\_\_\_\_

Field Office Manager

Date: \_\_\_\_\_